CHAPTER 5
CUMULATIVE IMPACTS

The most significant environmental effects may result not from the direct effects of a particular action, but from the combination of the minor effects of multiple individual actions over time (CEQ 1997b). The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of the *National Environmental Policy Act* (NEPA) define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain that "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."

5.1 METHODOLOGY

The cumulative impacts analysis presented in this document is based on the potential effects of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project when added to impacts from other actions in the region. The discussion in this chapter centers on the cumulative effects of past, present, and reasonably foreseeable future actions. The potential effects are evaluated both for the period of project construction (anticipated to be 12 to 18 months), and for the post-construction (operation) period of the project. The region of influence (ROI) varies for each resource area, primarily depending on the distance a potential effect can travel. For water and soil, the ROI is the watersheds described in Section 3.7, Water Resources; for biological resources, the ROI is the Sky Island Region as described in Section 3.3, Biological Resources; for land use, recreation, cultural, and visual, the ROI is the entire area (and viewshed) of the valleys and mountains between Tucson and Nogales, Arizona; for socioeconomics, the ROI is Pima and Santa Cruz Counties. For air quality, the ROI is the regional airshed in southern Arizona; the analysis contained in this chapter includes actions that could be reasonably anticipated to occur and have cumulative effects within the ROI. The potential for wind transport of air pollutants generated by reasonably foreseeable actions from Mexico into the ROI (in the U.S.) is included in the air quality cumulative impacts analysis. Following the discussion of potential cumulative impacts for each resource area for the entire ROI, potential cumulative impacts specific to the Coronado National Forest are discussed.

5.2 REASONABLY FORESEEABLE ACTION IDENTIFICATION

The following actions have been evaluated as reasonably foreseeable and are included in the analysis of cumulative impacts with the TEP Sahuarita-Nogales Transmission Line Project.

Other Transmission Line Projects. Public Service Company of New Mexico (PNM) has applied to the U.S. Department of Energy (DOE) for a Presidential Permit to construct an electric transmission line across the U.S.-Mexico border in Nogales, overlapping portions of the proposed TEP project as shown in Figure 2.1–4. PNM's overall proposed project consists of two new high voltage transmission lines originating at the Palo Verde Substation, approximately 125 mi (201 km) northwest of Tucson, and connecting through a number of alternative routes to a single proposed route through Nogales, Arizona, to the Santa Ana Substation in Sonora, Mexico. Specifically, PNM's proposed alternative corridor, termed the Pipeline Corridor, parallels TEP's proposed corridors for a total of approximately 44 mi (71 km) as they follow or cross the existing El Paso Natural Gas Company (EPNG) pipeline right-of-way (ROW). Like the TEP corridors, the PNM corridor contains a segment within the Coronado National Forest (approximately 15 mi [185 km]) and would require construction and ongoing maintenance access.

If TEP's proposed project goes forward, Citizens Communication Company (Citizens) would likely construct a new 115-kV transmission line from the proposed Gateway Substation (where TEP has begun preliminary construction activities) to Citizens' existing Valencia Substation in Nogales. The details of an

approximately 3-mi (5-km) proposed 115-kV line connecting TEP's proposed Gateway Substation to Citizens' Valencia Substation are given in an application to the Arizona Power Plant and Transmission Line Siting Committee (TEP 2001). Citizens' proposed routes run east from the proposed Gateway Substation and do not overlap with any proposed TEP corridors.

Industrial Development. The U.S.-Mexico border is a developing center of commerce. Currently, more than $1 billion of Mexican produce crosses the U.S.-Mexico border at Nogales bound for the United States and Canada each year, and approximately 1,300 trucks from Mexico enter Nogales everyday from November through May. The U.S. 1998 *Transportation Equity Act for the 21st Century* allocates funding for the development and improvement of high priority corridors, including the CANAMEX corridor leading north from the U.S.-Mexico border along Interstate 19 (I-19). In Federal Fiscal Year 2003, it is estimated that the CANAMEX states will receive on average an estimated $277 million per year per state. On the high end, it is anticipated that Arizona will receive $462 million per year for the development and improvement of high priority corridors (CANAMEX 2001). The State of Arizona has pledged additional funding. The development and improvement of this high priority corridor would involve roadway improvements that could lead to an increase in industrial parks, manufacturing facilities, and truck traffic, especially in Nogales, Arizona.

Trade Corridor/Roadway Development. In January 2000, the City of Nogales, Arizona initiated an engineering and cost Feasibility Study (City of Nogales 2000) for trade corridors in its vicinity. Figure 5.2–1 shows the proposed roadways (trade corridors) and proposed intersections with existing roadways (proposed interchanges). The two proposed roadways are:

- North-South Interconnector – A 7.3-mi (12-km) partially access-controlled expressway or super-arterial roadway connecting State Highway 189, in the vicinity of the U.S.-Mexico border, to I-19 at Ruby Road (including an upgrade of Ruby Road). This project was depicted in the feasibility study as a four-lane highway with a median in a 150-ft (46-m) ROW.

- East-West Interconnector – A 3.5-mi (5.6 km), five-lane arterial roadway connecting the proposed North-South Interconnector with State Route 82 in the vicinity of Business 19.

The Unified Nogales/Santa Cruz County Transportation 2000 Plan (known as Transportation 2000 Plan) (UN/SCC 2000) indicates that corridor studies for these projects are planned for 2001 through 2005, and that construction of these projects is planned for 2006 through 2010. The Transportation 2000 Plan lists these projects as not funded, and no more recent information is available (City of Nogales 2003).

As shown in Figure 5.2–1, the planning alignment for the North-South Interconnector includes an estimated 3.5 mi (5.6 km) approximately 800 ft (244 m) inside of (west of) the Coronado National Forest boundary. The East-West Interconnector planning alignment begins at the North-South Interconnector within the Coronado National Forest, and exits the forest 800 ft (244 m) to the east. The development of these trade corridors could lead to business development in the Nogales area including industrial parks, manufacturing facilities, and increased truck traffic.

Additional Activities in the Project Area. Other activities include livestock grazing, immigrant alien incursions, and possible activities under special use permits granted by the Nogales Ranger District of the Coronado National Forest. In addition to the reasonably foreseeable actions that are distinct potential projects, there are more generally defined possible actions in the project area which may contribute to cumulative impacts. Such actions may include an increase in residential development in the project vicinity, increased operations of the U.S. Border Patrol given current heightened security concerns, ongoing activity of undocumented immigrants near the U.S.-Mexico border, and local initiatives to protect biological resources.

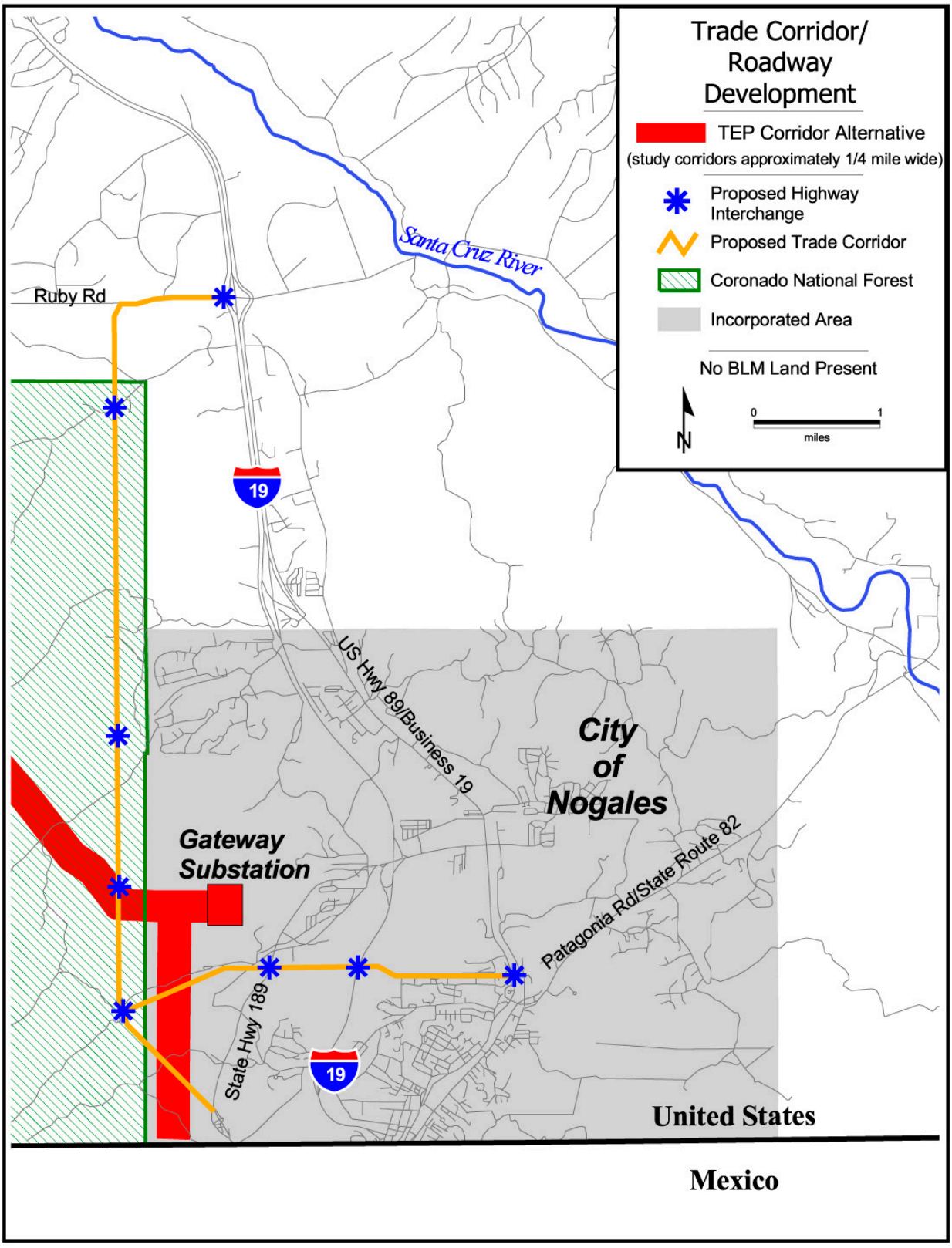

Figure 5.2–1. Trade Corridor/Roadway Development.

For example, in December 2001 Pima County incorporated the Sonoran Desert Conservation Plan into its comprehensive land use plan, although it has not yet been implemented. The Sonoran Desert Conservation Plan contains six areas of focus: Protection of Critical Habitat; Biological Corridors; Mountain Parks; Riparian Restoration; Historic and Cultural Preservation; and Ranch Land Conservation (Sonoran 2003). In the future, the county plans to apply for a multi-species Habitat Conservation Plan permit under the *Endangered Species Act* (ESA) to allow less specific protections for 55 federally listed species in exchange for habitat protection in the conservation reserve system under the Sonoran Desert Conservation Plan.

DOE has written to the U.S. Border Patrol about the proposed project (see Chapter 10); the U.S. Border Patrol has not brought any specific concerns to DOE's attention. The additional activities identified above have contributed to the creation of wildcat (unofficial) roads within the Coronado National Forest. Illegal immigrants continue to create footpaths and start unsupervised campfires at night.

Section 3.5, Socioeconomics, of this Draft Environmental Impact Statement (EIS) documents the growing population of the ROI. This could result in a trend toward increased residential development of Pima and Santa Cruz Counties.

To the extent that the potential environmental impacts of each of these possible activities can be identified, they are included in the cumulative impact analysis that follows.

5.3 CUMULATIVE IMPACTS ANALYSIS

The potential cumulative effects are evaluated both for the period of project construction (anticipated to be 12 to 18 months), and for the post-construction (operation) period of the project. Following the discussion of potential cumulative impacts for each resource area for the entire ROI, potential cumulative impacts specific to the Coronado National Forest are discussed.

The primary cumulative impacts from the combination of TEP's proposed project and other past, present, and reasonably foreseeable actions could affect land use (including recreation), visual resources, biological resources, cultural resources, socioeconomic resources, geology and soils, water resources, air quality, noise, human health and environment, and transportation. As detailed in Chapter 4, the proposed project's impacts to air, noise, water, and socioeconomic resources are minimal, and primarily associated with project construction, thus minimizing the potential for cumulative effects.

Land Use and Recreation. Land use may have adverse cumulative effects as a result of past, present, and reasonably foreseeable projects. The planning alignments of both the North-South Interconnector and the East-West Interconnector would cross TEP's proposed corridor near the Gateway Substation, and the PNM proposed project would potentially overlap with TEP's proposed project depending on the alternatives implemented as previously described. Potential industrial development associated with the CANAMEX corridor and residential development would introduce land use changes. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be development of land that is currently undisturbed or used for other activities such as ranching and recreation. The activities of the U.S. Border Patrol and illegal immigrants may further contribute to disturbance of land that is currently in a relatively natural state. When implemented, the Sonoran Desert Conservation Plan may help in defining a balance of land uses and in protecting them.

In general, national forest lands have historically been less impacted by construction and development than other land given USFS land management requirements. The cumulative impact of TEP construction outside of national forest lands would be part of a larger trend towards development, while construction

of the TEP project on national forest lands would be in areas less cumulatively impacted by other development (except for other permitted uses).

If multiple projects are under construction simultaneously, an increased amount of land would be used temporarily for construction lay down yards and staging areas. For example, construction of the proposed TEP, PNM, and roadway corridor projects, combined with potential residential construction would temporarily require land use changes in the ROI.

To the extent that changes in land use occur, areas that are currently used for recreation may no longer be available for recreation, or may provide a different recreation experience due to a more developed setting. While a majority of the area crossed by the proposed trade corridors is not currently utilized for recreation, the North-South Interconnector would be an upgrade of Ruby Road for an estimated 0.5 mi (0.8 km) near I-19, impacting recreational driving (due to a change in scenery) on Ruby Road. The proposed transportation corridors' primary purpose is to enhance freight movement in the area, and they are not specifically designed to (or expected to) attract recreational users.

Recreational activities within the Coronado National Forest are expected to increase due to increased area populations (see Section 3.5, Socioeconomics) and the need to find climatic relief or relief from urban stress. Increased access from multiple projects, especially transmission line projects that require ongoing maintenance access, could accelerate the increase in recreational use of national forest lands. The cumulative impact of increased recreational use of national forest lands could be a change in aspects of the recreational experience such as remoteness, and a possible need for more facilities for visitor management.

Visual Resources. Directly related to the potential for the cumulative impact of development of natural land uses from past, present, and reasonably foreseeable future projects, the viewshed of the valleys and mountains between Tucson and Nogales, Arizona would continue to be altered from its natural state. If the PNM project was built in the Pipeline Corridor and the TEP project was built in the Central Corridor, these projects would be adjacent to each other for approximately 44 mi (71 km). In this case, the visual impact would be concentrated and would be less than if both projects were in view but in different locations. The definition and protection of land uses through the Sonoran Desert Conservation Plan, when implemented, could contribute to keeping cumulative visual impacts of development within designated areas. The introduction of construction equipment and staging areas from multiple projects under construction simultaneously would result in temporary increased visual impacts to the ROI. (Also, refer to the discussion of cumulative impacts specific to the Coronado National Forest at the end of this chapter.)

Biological Resources. Natural habitats and special status species could be impacted by many of the past, present, and reasonably foreseeable future actions. As a result of TEP's proposed project combined with other transmission line projects, industrial, roadway, and residential growth, a cumulative development of land that currently provides natural habitat could occur. The activities of the U.S. Border Patrol and illegal immigrants, along with increased recreational use described previously under Land Use, would further contribute to disturbance of land that currently provides natural habitat. The Sonoran Desert Conservation Plan, when implemented, would help in defining and protecting a balance of land uses.

Construction of an electric transmission line could have adverse effects on special status species. PNM's Pipeline Corridor is similar to TEP's Central Corridor and would have similar potential impacts as described in Section 4.3, Biological Resources. The cumulative impact of disturbance of native habitat, as described in Land Use, could impact at least twice the area from the TEP project alone. This could result in pressures for animals to find new food sources and habitats, and a potential change in the species composition of the area.

Cumulative impacts on biological resources could result in localized modification and fragmentation of habitat. These impacts could result in a decline of biodiversity in the Sky Island Region. Since the majority of the Sky Island habitats are under Federal management (for example, national forest land), all future actions with potential for significant impact would be subject to analysis under NEPA.

Potential impacts to special interest species would occur under all of TEP's action alternatives (see Appendices D, E, and F). All potential impacts as a result of any of the action alternatives and any future actions involving a Federal decision (for example, PNM's proposed project) would be subject to consultation requirements under Section 7 of the ESA. Thus, these actions would be subject to requirements and mitigation outlined by the U.S. Fish and Wildlife Service (USFWS). Therefore, impacts to threatened or endangered species would not accumulate without USFWS review. Likewise, all future actions on land administered by the U.S. Department of Agriculture Forest Service (USFS) (for example, roadway development or PNM's proposed project) would require Management Indicator Species analysis, and would not accumulate without USFS review (see Section 4.3.5, Management Indicator Species).

New disturbances from all past, present, and reasonably foreseeable future projects would provide a potential point of entry for invasive species onto the landscape, which could lead to adverse modification of the surrounding ecosystems. Colonization of an invasive species within the ROI would be a significant impact. The potential for introduction of invasive species would be greatest during construction of one or more projects, and would continue to exist during any project maintenance required. Increased access roads from multiple actions could result in increased disturbance of existing vegetation.

Cultural Resources. Directly related to the cumulative impact of natural land development caused by past, present, and reasonably foreseeable future projects, increased disturbance from multiple actions could result in cumulative adverse impacts to currently unknown cultural resource sites. In addition to project-related disturbance, the increased accessibility created by new roads built for the project can cause cumulative impacts in the form of increased public visitation, recreational impacts, and vandalism. If multiple actions occur, special care would need to be taken to address these cumulative impacts with appropriate mitigation or evaluation measures. Construction of TEP's proposed project along the EPNG pipeline ROW and PNM's project along the Pipeline Corridor would minimize the potential for discovery of unknown cultural sites as much of this area was previously disturbed for construction of the gas pipeline. Increased access roads from multiple actions could result in increased human disturbance to cultural resources.

In addition, Tribal representatives listed in Table 3.4–1 have expressed through ongoing Tribal consultations for TEP's proposed project that they value the project area's natural landscape. The cumulative impact on the area landscape from multiple projects would be greater than from the TEP project alone, and would likely evoke a similar concern.

Socioeconomics. Future economic development in the region could bring economic benefits to Pima and Santa Cruz Counties. Improvements in the CANAMEX corridor, including planned roadways, have the potential to significantly impact the economy of the border region near Nogales, leading to the creation of more jobs and revenue for the region. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be to generate more revenue and employment in both counties during and following their construction. However, any cumulative growth effect could also have the potential to impact (and stress) community resources such as schools, police, and fire protection, but is too speculative for cumulative impact analysis.

Geology and Soils. Directly related to the potential for the cumulative impact of development of natural land uses from past, present, and reasonably foreseeable future projects, cumulative adverse impacts to soil resources could result from an increased area of disturbance for construction of multiple projects.

These cumulative impacts would be similar to the potential impacts described in Section 4.6.2, Soils, but over a larger area of disturbance. These impacts include an increased potential for erosion and soil compaction from large equipment, and from decreased vegetation cover resulting from clearing of proposed roads and ROWs where necessary. Construction of TEP's proposed project along the EPNG pipeline ROW and PNM's project along the Pipeline Corridor would minimize the new area of soil disturbance.

Water Resources. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be an increase of water use in the ROI. This potential short-term impact would be greatest if multiple projects were constructed simultaneously, as water would be used for dust control and other purposes. In the long term, operation of transmission lines requires little if any water, so would not contribute to a cumulative long-term increase in water demand from potential residential and industrial growth.

Air Quality. The cumulative impact of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be an increase in airborne dust and vehicle emissions within the ROI. This potential impact would be greatest if multiple projects were constructed simultaneously due to the potential for airborne dust generation. An additional source of air pollutants in the U.S. could be wind transport of airborne dust or pollutants from Mexican transmission line or roadway construction activities in or near Nogales, Mexico. Construction vehicle emissions (as described in Section 4.8) would be greatest if multiple projects were constructed simultaneously, but would tend to dissipate within a few days rather than accumulate in the air over time. In the long term, operation of transmission lines generates very little air emissions, so it would not contribute to a cumulative increase in air emissions that could result from an increase in truck traffic associated with the CANAMEX corridor.

Noise. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be an increase in noise levels during periods when construction projects occur simultaneously. Cumulative noise impacts would be short term and limited to daylight hours. No long-term cumulative noise impacts would occur.

Human Health and Environment. The cumulative impacts to human health and safety could be an increase in background electric and magnetic field (EMF) exposure to residents in the immediate vicinity of overlapping transmission line projects (for example, by TEP and PNM). Section 4.10 gives example EMF exposures of two 345-kV transmission lines operating adjacent to one another (on BLM land, in this case). The EMF levels in this example at a distance where residences would potentially be located are well below 0.8 milligauss (mG), the average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). While extensive research has been conducted to determine if exposure to electric or magnetic fields may cause or promote adverse health effects, the National Institute of Environmental Health Sciences (NIEHS) concluded that "The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak" and that "The probability that EMF exposure is truly a health hazard is currently small" (NIEHS 1999). Based on an assessment such as this, no long-term cumulative human health impacts are expected to occur. However, the subject remains controversial (see Appendix B).

Multiple simultaneous construction projects could result in a temporary increase in traffic congestion and traffic accidents and a decrease in worker safety. No longterm cumulative traffic impacts would occur.

Transportation. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be a cumulative development of more roadways for project access and private and commercial use. The activities of the U.S. Border Patrol and

illegal immigrants may further contribute to the development of new roadways and paths. This change in land use has implications for a number of resources areas as previously described. In addition, multiple simultaneous construction projects could result in a temporary increase in traffic congestion.

Both the PNM and TEP proposed projects include corridors with a segment on the Coronado National Forest, and would require construction and ongoing maintenance access on national forest lands. Construction of TEP's proposed project along the EPNG pipeline ROW and PNM's project along the Pipeline Corridor would minimize the need for new project access. Cumulative traffic impacts would be short term and limited to daylight hours. No long-term cumulative traffic impacts would occur.

Environmental Justice. TEP's proposed project would not result in any disproportionately high and adverse impacts for the minority or low-income population, as described in Section 4.13. No means were identified for minority or low-income populations to be disproportionately affected and TEP's proposed project would not contribute cumulatively to any environmental justice impacts.

Cumulative Impacts Specific to the Coronado National Forest. In addition to the potential cumulative impacts described above for each resource area, which include impacts on national forest lands, the following discusses issues specific to the Coronado National Forest. The cumulative impacts from increased road access into any TEP corridor on the Coronado National Forest, combined with other past, present, and reasonably foreseeable projects, have the potential to adversely affect biological resources, visual resources, cultural resources, land use, and soil.

Cumulative adverse impacts to cultural resources could result from increased disturbance for construction of multiple projects that could disturb currently unknown cultural resource sites. Tribal consultations indicate that disturbance to the natural landscape would also be considered an adverse impact to cultural resources. If multiple actions occur, special care would need to be taken to address these cumulative impacts with appropriate mitigation or evaluation measures.

Cumulative adverse impacts to soil resources could also result from an increased area of disturbance for construction of multiple projects. These cumulative impacts would be similar to the potential impacts described in Section 4.6.2, Soils, but over a larger area of disturbance. These impacts include an increased potential for erosion and soil compaction from large equipment, and from decreased vegetation cover resulting from clearing of proposed roads and the ROW where necessary.

Recreational activities within the Tumacacori EMA are expected to increase due to increased area populations (see Section 3.5, Socioeconomics) and the need to find climatic relief or relief from urban stress. Increased access from multiple projects, especially transmission line projects that require ongoing maintenance access, could accelerate the increase in recreational use of national forest lands. This could adversely impact natural and cultural resources as described above. The cumulative impact of increasing development on national forest lands could be a change in the Recreation Opportunity Spectrum (ROS) settings. By causing a change in access, naturalness, and other ROS setting indicators, the range of possible ROS settings available for recreation could be narrowed. While most of the area crossed by the proposed trade corridors is not currently utilized for recreation, the North-South Interconnector would be an upgrade to Ruby Road for an estimated 0.5 mi (0.8 km) near I-19, further impacting the scenery for recreational driving on Ruby Road. Beyond Ruby Road, the proposed transportation corridors' primary purpose is to enhance freight movement in the area, and are not specifically designed to (or expected to) attract recreational users who would place a high value on scenery.

The specific potential cumulative impacts from the proposed trade corridors development on and adjacent to the Coronado National Forest and TEP's proposed project would be to land use, visual, biological, and cultural resources, as described above. The planning alignments of both the North-South Interconnector

and the East-West Interconnector would cross TEP's proposed corridor near the Gateway Substation (outside of national forest land), would have a dominant visual impact and would impact overall Scenic Integrity in this area.

The cumulative impact of TEP's proposed project and other past, present, and reasonably foreseeable future actions could be a loss over time of land that gives the overall visual impression of bieing relatively undisturbed by human activities (that is a natural landscape). This change in landscape character (see Section 3.2, Visual Resources) could especially occur in rapidly growing southeastern Arizona. Public lands, such as the Coronado National Forest, are some of the few remaining natural landscapes, and these natural landscapes on national forest lands have increasing impacts from development as time goes on. For example, in the neighboring Santa Rita Mountains southeast of Tucson, the Whipple Observatory complex, Melendrez Pass communication site, and proposed Very Energetic Radiation Imaging Telescope Array System Project impact otherwise natural lands. Other potential contributors to these cumulative impacts on national forest lands include roadways, housing, commercial development, livestock grazing, recreation activities, undocumented immigrant activities associated with the U.S.-Mexico border, mining projects, and other possible activities under special use permits. Further evaluation of potential cumulative visual impacts is currently underway by DOE in consultation with USFS. The results of this evaluation will be included in the Final EIS.